Labyrinthodonts; and lastly some beds of Jurassic age. Until the base of the Upper Carboniferous is reached there is nothing abnormal, but at this point occur the remarkable intercalations of glaciated conglomerates, of which we have some slight indications in our English Permian, and which stretch both to India and Africa. This climatic change killed off the Lepidodendrons, and introduced a new flora containing the wide-spread Glossopteris and its ally Gangamopteris, and Nöggerathiopsis, types which would in Europe appear more at home in the Rhætic than in the Carboniferous, and which followed the changing climate as it spread to other continents. Meanwhile, the Carboniferous fauna of the seas is unaffected, and heterocercal fish accompany plants of quite Jurassic character in the Permian. This mingling of newer land floras with older marine faunas seems so universal in extra-European geology, particularly in America, that it appears as if during period after period the development of marine life was especially forced or quickened in the area which is now Europe, while terrestrial plant life was retarded, especially in England. The genera Glossopteris, Gangamopteris, and Nöggerathiopsis do not extend up beyond the Permian in Australia. In India Glossopteris is rare in the Jurassic, but its recorded extension into the Cretaceous of Russia must be questionable, while its supposed occurrence in the Tertiary of Novale is certainly due to its having been confused with the common Tertiary, and still existing, *Chrysodium aureum*, identical with it in venation but quite different in fruiting. In addition to these, the most noteworthy species are the beautiful adiantoid Rhacopteris of the Lower Carboniferous, to which several plates are devoted, and the Osmunda-like Thinnfeldia of the Mesozoic. The flora of the latter is only remarkable for its very European facies, and is said to include a Jurassic Sequoia, Cunninghamites, Baiera, Walchia, Taxites, and several Cycadeaceæ; it also shares with the Permian the fine *Brachyphyllum australe*, Feistm. There are altogether about 129 species or varieties described, of which about 50 are illustrated, and the volume is certainly a valuable contribution to the history of plant distribution.

J. S. GARDNER.

OUR BOOK SHELF.

The Development of Africa. By Arthur Silva White. (London: George Philip and Son, 1890.)

THERE can be no doubt that Africa is destined to occupy a much more prominent place in the thoughts of Europeans than it has occupied hitherto. The recent marking-off of vast "spheres of influence" may not have very important immediate results, but sooner or later attempts will certainly be made on a great scale to find out in these regions new channels for industry and commerce. It is evident, therefore, that the conditions of the development of Africa ought to be carefully studied; and in the present work, Mr. White supplies all the materials, so far as they are now known, for an adequate comprehension of the subject. He begins with a bird's-eye view of the continent, showing its geological and physical structure, its oceanic and inland drainage-basins, and the coincidence of political settlement with oceanic drainage-areas. Next he deals with the geographical distribution of the chief mountain-systems, and the consequent development of the great river-systems, in relation to accessibility from the sea and internal communications. Under the heading of "climate and cognate phenomena" he treats of the distribution of temperature; actual temperatures; the distribution of atmospheric pressure, and prevailing winds; annual rainfall; distribution of soils; zones of vegetation; distribution of animals; classification of climates; and acclimatization. Then come chapters on the indigenous populations, Islam and Christianity, the traffic in slaves, the progress of exploration, commercial resources, the European domination, and political partition. In the concluding chapter the author presents the general principles underlying the development of Africa along natural lines, derived from an examination of the various aspects under which the continent is known to Europe at the present day. He displays a thorough mastery of the facts relating to the various questions he discusses, and his work will be of genuine service to all who may be for any reason, whether theoretical or practical, interested in the utilization of Africa's material resources. The volume is accompanied by a most valuable series of maps, specially designed by Mr. Ravenstein.

The Pinks of Central Europe. By F. N. Williams, F.L.S. 66 pages, with 2 plates. (London: West, Newman, and Co., 1890.)

THIS forms a third instalment of Mr. Williams's studies of the genus Dianthus. His first paper was devoted to an enumeration and classification of all the known species. In his second he described the pinks of Western Europe, and traced out in detail their synonymy and geographical distribution. In the present paper he deals in a similar manner with the species that inhabit Central Europe. For Central Europe as a whole he claims 76 species out of a total of 230, which are disposed through the different countries as follows: viz. Austria, 59; Roumania, 24; Servia, 22; North Italy, 17; Switzerland, 15; Germany, 11; Poland, 7; Denmark, 5; and South Sweden, 4. His descriptions are clear and concise, but he has followed the Continental authors in classing as species many types which most English writers would place as varieties. None of the species are new, but it is a great convenience to have them all brought together, and treated on a uniform plan. The book is dedicated to Cardinal Haynald.

Materials for a Flora of the Malayan Peninsula. By Dr. G. King, F.R.S. No. 2. 93 pages. (Calcutta, 1890.)

THIS is a second part of Dr. King's Flora of the Malay peninsula, reprinted from the Journal of the Asiatic Society of Bengal. It covers the orders Bixineæ, Pittosporeæ, Polygaleæ, Portulaceæ, Hypericineæ, Guttiferæ, and Ternströmiaceæ. These were dealt with in Hooker's "Flora of British India" in 1872–74. Since that time a large amount of new material has been accumulated, principally by Kunstler, Scortechini, and other collectors whom Dr. King has sent out. Out of the orders just enumerated the first and two last are well represented in the Malay peninsula. In Bixineæ, Erythrospermum, known before only in Mauritius and Ceylon, is now recorded from Perak, an endemic species. In the same order the two curious Malayan genera, Teraktogenes, of Hasskarl, and Ryparosa of Blume, are added to the Indian flora, and four species of the former, and six of the latter, all endemic, are here for the first time described. In Polygaleæ there are ten new species of Xanthophyllum. In Garcinia, which has lately been fully dealt with in Pierre's "Forest Flora of Cochin China," fifteen new species are described out of a total of thirty-six now known in the Malay peninsula. In Calophyllum there are six new species, in Kayea four, and in Ternströmiaceæ two new species of Adinandra, one of Ternströmia, one Eurya, one Actinidia, two of Pyrenaria, and three of Gordonia. The publication of Hooker's "Flora Indica" has given

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the Indian botanists a firm platform to work upon, and it is very gratifying to find that so much has been done within so short a time, and that the working out of the new material has fallen into such competent hands.

The Colonist's Medical Hand-book. By E. A. Barton. (London: Cassell and Co., 1890.)

THE author explains that this little volume has been "written expressly for the use of colonists and squatters, who are entirely out of reach of medical assistance." A more suitable book of the kind could not be at their disposal. They will readily understand his directions, and in recommending appliances for the treatment of emergencies he has taken care to refer only to such as are likely to be found in any squatter's hut.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Dr. Romanes on Physiological Selection.

As Dr. Romanes now declares that the essence of his theory of physiological selection is "that some amount of infertility characterizes the distinct varieties which are in process of differentiation into species," and that the occurrence of infertility among the members of an undifferentiated species is secondary and comparatively unimportant, I ask leave to quote one or two more of his original statements, in addition to the four emphatic passages quoted in my communication of November 27.

(1) "When accidental variations of a non-useful kind occur in any of the other systems or parts of organisms, they are, as a rule, immediately extinguished by intercrossing. But whenever they happen to arise in the reproductive system in the way here suggested, they must inevitably tend to be preserved as new natural varieties, or incipient species. *At first the difference would only be in respect of the reproductive system; but eventually, on account of independent variation, other differences would supervene, and the new variety would take rank as a new species*" (NATURE, vol. xxxiv. p. 316).

The words I have italicized show clearly that variation in fertility only was what Dr. Romanes then claimed as essential to his theory. Again, after referring to variations in the season of flowering as a "well-known and frequently observed cause" of isolation, he adds:—

(2) "But it is on what may be called spontaneous variability of the reproductive system itself that I mainly rely for evidence of physiological selection" (*l.c.*, p 337).

The meaning of this is still further enforced by other passages. After discussing the supposed causes of infertility, he says:—

(3) "Why should we suppose that, unlike all other such variations, it can never be independent, but must always be superinduced as a secondary result of changes taking place elsewhere? It appears to me that the only reason why evolutionists suppose this is because the particular variation in question happens to have as its result the origination of species" (*l.c.*, p. 339).

And again:—

(4) "It appears to me much the more rational view that the primary specific distinction is likewise, as a rule, the primordial distinction; and that *the cases where it has been superinduced by the secondary distinctions are comparatively few in number*" (*l.c.*).

Notwithstanding the passages I have now quoted, emphasizing eight times over, in different ways, that the theory is essentially one of variations as regards fertility and sterility alone, Dr. Romanes now says that, even if all this is wrong, "the principle of physiological selection, as I have stated it, is not thereby affected." If this is not an absolute change of front, words have no meaning; and it is further shown to be so by the fact that Dr. Romanes acknowledged that Mr. Catchpool had "very clearly put forward the theory of physiological selection." But Mr. Catchpool clearly distinguished between the old theory that species arise *first* by variation in form and structure, and only *gradually* become mutually infertile, and the new theory that they arise "by spontaneous variations in the generative elements, and are in this case *originally* mutually infertile, but only *gradually* become otherwise divergent" (*l.c.*, vol. xxxi. p. 4).

That this was the essential and original "physiological selection," that was claimed as supplying the missing link required to make the origin of species by natural selection a reality, is yet further shown by the repeated statements that physiological "selection" is a powerful preservative agent. Besides the statement already quoted, that variations in fertility "cannot escape the preserving agency of physiological selection," we have the assertion, quoted above, that such variations "must inevitably tend to be preserved as new natural varieties or incipient species," and the following still more emphatic assertion:—"Neither are we concerned with the degrees of sterility which the variation in question may in any particular case supply. For whether the degree of sterility with the parent form be originally great or small, the result of it will in the long run be the same: the only difference will be that in the latter case a greater number of generations would be required in order to separate the varietal from the parent form."

Now my contention has always been, and still is, that there is no principle at work which can accumulate or even preserve the variations of infertility occurring in an otherwise undifferentiated species, and that the term physiological "selection" is therefore a misnomer, and altogether misleading. If Dr. Romanes will carefully work out numerically (as I have attempted to do) a few cases showing the preservative and accumulative agency of pure physiological selection within an otherwise undifferentiated species, he will do more for his theory than volumes of general disquisition or any number of assertions that it *does* possess this power.

My next contention is, that this is the only new part of his theory—as he himself shows by his reference to the ordinary view, of sterility following other changes, as that which "evolutionists suppose." All the rest is to be found more or less fully discussed in Darwin's works; and I myself claim only to have carefully studied Darwin's facts, and his brief but most suggestive discussion of them in his chapter on "Hybridism" (vol. ii. of "Animals and Plants under Domestication"), and by arranging them more systematically to have shown that they do really give a fairly consistent and sufficient solution of the problem. The only part of my work I claim as a distinct addition to the theory is the proof that, under certain conditions that appear to me probable, natural selection *is* capable of increasing incipient infertility between distinct races or varieties; and the same view was submitted to Darwin twenty years ago.

Lastly, I totally and emphatically deny that any portion of my facts or conclusions on the subject were derived from Dr. Romanes's writings on "physiological selection." The only two sentences he has quoted from my book to prove that I have done so merely express what he himself has declared to be the common opinion of evolutionists, and which is also the direct outcome of the facts collected by Darwin. If this is "the whole essence of physiological selection," then physiological selection is but a re-statement and amplification of Darwin's own views, since he certainly assumed, and proved, that "some amount of infertility" characterized "some varieties" of animals and plants, and that this infertility, when it occurs, is of some use in preventing the swamping effects of intercrossing. I feel sure that if *this* had been stated, at the outset, to be what was termed "physiological selection," no discussion would have arisen as to the principle involved, but only as to its novelty and as to the appropriateness of the name given to it.

If now, notwithstanding his repeated and emphatic statements that variation as regards fertility in otherwise undifferentiated species was what constituted the basis of his theory of physiological selection, Dr. Romanes continues to assert that I have adopted that theory "purely and simply, without any modification whatever," it will show that our respective standards of scientific reasoning and literary consistency are so entirely different as to render any further discussion of the subject on my part unnecessary as regards myself and useless as regards Dr. Romanes.

ALFRED R. WALLACE.

A Large and Brilliant Fire-ball Meteor.

ON Sunday night, December 14, between 9h. 40m., and 9h. 45m. G.M.T., I had the good fortune to witness the display of a most magnificent fire-ball meteor. It rose rapidly with a bright blue trail from an altitude of 6° above the horizon,

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